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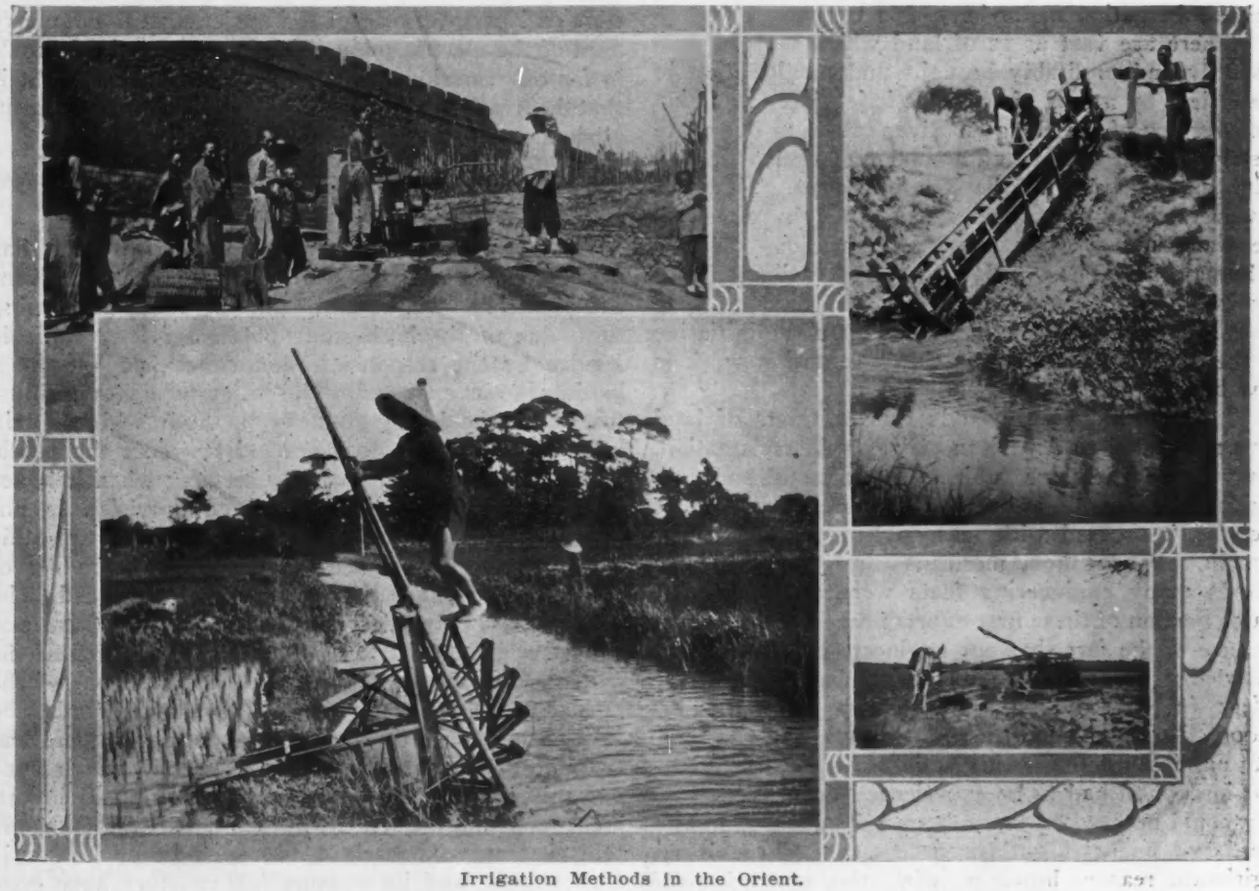
IRRIGATION METHODS IN THE ORIENT

BY ROBERT SIBLEY.

To those familiar with the modern electric pump and the concrete canal, the crude and yet ingenious devices used for irrigation in Japan and China are of more than passing interest. Although certain provinces in these two great nations are quite modern in irrigation methods, nevertheless even the casual observer may see on all sides how human effort is still made to take the place of electrical propulsion.



Irrigation Methods in the Orient.

Fig. 1. Drawing Water from Chinese Well.
Fig. 2. Irrigating With Chain of Buckets.
Fig. 3. Japanese Footpower Pumping.
Fig. 4. Chinese Mulepower Pumping.

Thus in Fig. 1 which is a view taken immediately outside the city walls of an interior city of China, one may see the parallel of the "old oaken bucket" in strange environment. Here the farmers draw water for the irrigation of their gardens, often packing it on human backs a considerable distance. In Japan many rice fields on the terraced hillsides are thus irrigated, men, women and children all being engaged in this severe physical exertion.

In the Philippine Islands nearly every conceivable household use is made of the bamboo pole which grows so luxuriously in those parts of the Orient. In many of the islands water is conveyed to the native huts by being encased in long bamboo poles which are closed at the ends with stoppers. These long cylindrical shaped buckets are taken to their desired destination upon the backs of the natives.

Fig. 2 shows an inclined trough with crude

wooden buckets belted to a windlass, hand-propelled, for raising the water from a main distributing canal to a lateral in Central China. In Fig. 3 a Japanese is shown turning a large wheel by means of whose outwardly projecting wooden vanes on the circumference of the wheel the water is raised into the lateral canal.

By far the most ingenious method of raising water, however, that came to the attention of the writer during his travels in the Orient is that shown in Fig. 4. Here we have a mule turning a tread, which by means of a crude bevel gear arrangement, causes water to be raised from beneath the surface for irrigation purposes. The mule is blind-folded and is made absolutely self-acting. This is accomplished by having a lead rope tied to the pole seen projecting in the front. When once started the mule thinks he has some one leading him since the pole with the lead travels synchronously with the tread. If, however, for any reason the mule decides to take a rest and halts, the lead line in front jerks him ahead and the tread pole in the rear gives him a decided kick. This arrangement of "getting it going and coming" is amusing to behold and certainly proves effective in grinding out continuous "mule-power" as applied to Chinese irrigation methods.

There are vast areas of land which may be successfully and profitably brought under cultivation in the Orient by means of scientific irrigation. In China the overflow of the Yang-tsi River causes at one place a strip of land to have an annual replacement in fertility that fairly rivals the Nile of Egypt. Thus far, however, the uncontrolled floods, though refreshing the wasted land, often cause a tremendous sacrifice in human life. The overflow can be so easily and economically handled and will bring such blessings to so many of the suffering natives that upon the initiative of the American Red Cross the reclamation work is now being started.

In the Philippine Islands certain tracts of land have responded to American endeavor in reclamation. Many more tracts are subject to successful and economic handling. It is best and wisest, however, that such work proceed with reasonably slow but steady growth. When the Americans first occupied the islands many engineering feats were attempted. A major portion of these first efforts proved futile largely because of the fact that our engineers had no reliable knowledge or data upon which to base reasonable safety in construction. The lesson from the typhoon, the water spout, the cloudburst, and the hitherto unknown deteriorating action of tropical growths and insects all had to be experienced before construction could proceed on too unbounded a scale to justify the large financial outlays necessary. There is no legitimate reason, however, with the mastering of these details, why the Philippine Islands should not in time become a center of profitable and well-regulated reclamation.

It is not to be supposed from this descriptive article that there are no efficient irrigation methods employed in the Orient. The descriptions and illustrations already alluded to are, however, in common usage among the cooley class of farmers, which is by far the most populous class in the Orient. The main systems of distribution, especially for the rice fields of Japan, are substantial and in traveling by train up through the heart of the Japanese empire, the well-regulated and carefully planned irrigation works for the rice fields, often bring forth the admiration of the foreign engineer. In China, too, some two thousand miles up the Yang-tsi River, are to be found the most fertile provinces of the great celestial kingdom. This is due to the vast irrigation system which has been in existence since time immemorial. A valley or rather extensive stretch of plain fifty miles by fifty miles comprises the largest of this kind. The region is so fertile and productive as a result of the effective system of irrigation here found, that the native Chinese are very jealous of their possessions and frown with considerable displeasure at any foreign settlers who may journey up the great river for the purposes of settlement. Indeed, so intense is this feeling that their own countrymen further down the stream are classed as foreigners.

Nevertheless, when one looks upon these great works of human effort, handed down from ages past, although he is awe-struck upon observing the knowledge and perseverence of the ancients, still the merry hum of the electric pump with its cement lined canals in far off America, haunts his memory and then it is that he realizes in their fullest splendor the accomplishments of modern invention.

THE JITNEY AS AN EDUCATOR.

We are bound to admit that the jitney bus has made good as an educator. Previous to its advent the public had vague and rambling ideas concerning the value of the high-grade public service. Reliable service by the responsible companies had become a habit. It was expected. The jitney furnishes an illustration of the happy-go-lucky methods which obtain where organization does not exist; where the public is not assured of continuity of service; when it is not protected against accident; where provision is not made for replacement, and where all of the scientific and economic principles that govern the conduct of modern affairs have been ruthlessly disregarded. The depreciation of properties devoted to public use and the necessity for setting aside a certain portion of the annual revenues for replacement, has been one of the most difficult points for the public to understand. The jitney comes into the limelight supplying a lucid and tangible answer and a working example which none can misconstrue. It shows how even a small investment consumes itself if not safeguarded. We are told that approximately a thousand jitney busses in Los Angeles and its surrounding territory have gone to rack and ruin during the last few months, leaving their owners stranded, with nothing to show for their original investment but a few dollars' worth of junk. The jitney is almost an exact prototype of the municipally owned and privately owned eletcric plants. Business has its basic and fundamental laws which cannot be disregarded. If they are disregarded, disaster is the inevitable result.—Edison Current Topics.

EXTORTIONATE STREET LIGHTING CHARGES AT SEATTLE.

The city council of Seattle is engaged in reducing the budget of expenses for the year 1916, in an attempt to keep the tax levy within reasonable bounds and at the same time take care of deficiencies in revenue created by the state going dry.

In this connection, the street lighting rate offers a fruitful field for a reduction in the tax levy of at least one mill. The taxpayers have submitted to extortionate rates for street lighting ever since the municipal lighting plant started to operate for the benefit of private consumers, many of whom are not taxpayers. The Home Owners' and Building Owners' Association, as well as other civic bodies, have repeatedly protested and demanded a reduction of the street lighting rates without obtaining any relief, except that on January 1, 1915, the rate was reduced from 4½c to 4c. per kw. hr. On the other hand, however, private consumers have had service at lower rates, frequently at cost, and even less than cost, to the lighting department.

Street lights are operated approximately 4000 hours per annum. A business house using the municipal service and operating its lights the same number of hours is entitled to a rate of approximately 2¼c per kw. h. under the city rate schedule, while the general fund of the city supplied by the taxpayer is charged 4c per kw. hr. This discrimination is excused on the ground that street lighting is more expensive to supply than the service furnished to private consumers. It is true that the department supplies lamps and maintains the street lights, and it is also true that the private consumer is entitled to free carbon lamps and a less than cost price on small tungsten lamps, while the large tungsten units, similar to those used largely for street lighting, are furnished free. It is also true that a large number of small 50-watt lamps are used in street lighting, but the superintendent states in his report that these lamps have a life of 4000 hours, or one year of city lighting, and the cost of this lamp therefore adds very little to the cost per kilowatt hour of the current. On the other hand, the cost of generation is no greater for the street lighting current than for the private consumers, while the cost of distribution of the street lighting service is far less. When the cost of service is considered for street lighting and private consumers, it will be readily seen that the expense of transformers, meters, connections, soliciting, bookkeeping and other charges is enormously greater for private consumers, as this service is supplied to some 34,000 private consumers as compared to one consumer—the city—which pays for the service out of the taxpayers' contribution.

All this leads up to the question, Is the protest of the taxpayer against high street lighting rates justified?

In 1913 the demand of the street lighting system was 13.8 per cent of the total power generated. The department charges two-sevenths operation, maintenance and reconstruction of pole lines to the street lighting system. Using these data and the figures from the superintendent's 1913 report, the following cost figures for street lighting in 1913 are obtained:

Cost power generated, $67,658; 13.8 per cent to street lighting	$ 9,337
Cost pole line operation, maintenance and reconstruction, $13,653; 2/7 to street lighting	3,900
Cost street lighting distribution	41,306
Bond interest charged in 1913, $83,625; 13.8 per cent to lighting	11,540
Depreciation charge, 1913, $193,333; 13.8 per cent to street lighting	26,680
Add for general expense	5,000
Total cost of street lighting, 1913	$ 97,763
Total charged taxpayers, 1913	211,014
Profit from street lighting, 1913	$113,252

The 1913 report shows that 4,799,670 kw. hr. were consumed for street lighting, so that the cost to the department was 2.04c per kw. hr., and the taxpayer was charged 4½c per kw. hr. for this current. The private consumers, however, fared very much better than this, as the report shows that the average rate paid by all private consumers was 3.43c per kw. hr., and as these private consumers, according to the superintendent's report, consumed 21,507,191 kw. hr., costing to produce, including depreciation, $538,056, the cost to the department to supply this current to private consumers was approximately 2.5c per kw. hr.

In October, 1912, the private company offered to furnish the street lighting service at 2¾c per kw. hr. and pay the city $40,000 per annum rental for the use of the street lighting system, besides a pin rental of 25c per pin. Had this offer been accepted, the taxpayers would have had to contribute only $91,991 for street lights which cost the city lighting department $97,763 to furnish, and the taxpayers $211,014 for the year 1913.

The department has not issued any report for 1914 as yet, but the city comptroller's report of May 1, 1915, shows $226,898 collected from the taxpayers for street lighting. During the year additional lamps were installed and there was a small increase in the power required. More efficient lamps were installed in place of old types that had been in use for a number of years. Based upon the figures given by the comptroller, the cost of the street lights in 1914 is as follows:

Generation	$ 20,337
Interest	11,540
Distribution	46,312
Depreciation	26,735
Pole line	5,412
General expense	5,000
Total cost street lighting, 1914	$115,336
Total charged taxpayers, 1914	226,898
Profit street lighting, 1914	$111,562

At 4½c per kw. hr. there were supplied for this service 5,042,180 kw. hr., at an approximate cost to the department of 2.29c per kw. hr., while the taxpayers were charged 4½c per kw. hr. for this current. At the private company's rate, this service would have cost the taxpayers $98,660, as against the lighting department cost of $115,336, and the city's charge of $226,898 taken from the general fund of the city.

Meter deposits for gas, water, electric light and telephone utility companies of California have been abolished by order of the railroad commission. The decision releases nearly a million dollars which has been held in escrow. In lieu of a $5 deposit, the new consumer, if not a property holder, may secure a sponsor or pay $2.50. The commission holds that all reasonable extensions be made at the expense of the companies.

LETTER TO THE EDITOR.

Water Power Legislation.

Sir:—Relative to Mr. H. J Pierce's article on water power legislation:

In this article, Mr. Pierce has set forth at some length suggested changes in the Ferris Bill as presented to the Senate of the United States and later referred to the Committee on Public Lands. Mr. Pierce has spent much thought and study in suggesting modifications which will not materially change the original bill, but which in all instances would make it more acceptable to those contemplating developments on the public domain.

There are a few points in connection with it, however, which might be brought out more strongly, and since he has already suggested some changes, these could be elaborated on to a slight extent and perhaps make it more complete and tend to prevent misunderstanding at a later date.

In Section 5 it is stated that the "United States may have the right to take over, upon mutual agreement, a severable and complete unit of any such power system." It is believed that this should be stated at somewhat greater length in order to make it clear just what parts or portions would be or should be taken over by the government. If, for instance, a power plant operating under permit from the government was one of several plants owned by a company furnishing power for the operation of several city street railways, interurban lines, and supplying the commercial needs of several cities, just what portion of the system would be taken over by the government? If only the power plant itself, together with its primary transmission line was considered, it might easily work a very serious hardship to the company. It might be more just to the company to take over, in addition, some of the power contracts entered into with industrial concerns, some of the distributing systems in the cities and other portions of the works which to a greater or less extent are dependent upon the water power plant located upon government land. I think it can be easily seen that there might be a great injustice done unless this was considered by government officials who were broadminded and thoroughly familiar with the operation of such utilities.

In Section 8, Mr. Pierce has inserted the word "reasonable" in the fourth line of this section so that it now reads as follows:

"The Secretary of the Interior is authorized to specify in the lease and to collect reasonable charges or rentals for all land leased."

This brings up the question of what is a reasonable charge and how it should be determined. With the present methods employed by the Forest Service, the load factor which will be maintained by the plant is assumed, and is one of the factors used in determining the charge. The higher the load factor maintained by the plant, the higher the annual charge imposed on it by the government. In other words, an operating company conserving to a greater extent the natural resources is more highly penalized than one not so doing. As continuous users of large blocks of power (and by large blocks is meant amounts in excess of perhaps 10,000 horsepower) are usually those industries which operate three hundred and sixty-five days in the year and maintain an unusually high load factor, running from 80 to perhaps as high as 90 per cent; with a plant so located as to be able to take advantage of storage, with a large forebay where sufficient water can be had to take care of heavy fluctuations in the load, the charge imposed under present Forest Service regulations, with a load factor of from 80 to 90 per cent, would be at the end of ten years approximately 80 or 90c per horsepower year. When it is considered that these large industries are now seeking low cost power, and when it is further considered that they are now securing power at from $15.00 to $18.00 per horsepower year, it can readily be seen that the imposition of a charge of 90c per annum would be a tax of five per cent or greater on the gross revenue of the company. This in itself is a very important point to be considered and one that should be given further consideration if the present method of determining the charge is continued. It is strongly believed that this method is not the proper, just or correct one, and it is to be hoped that some other method will be devised that will lessen the heavy tax. If, as the Secretary of the Interior and other government officials state, the Ferris Bill is not for revenue-producing purposes, why attempt to impose an additional tax of from 3 to 5 per cent on the gross revenues of a possible operating company?

In Section 8, that part eliminated by Mr. Pierce as follows:

"Which charges or rentals may in the discretion of the Secretary be measured by the power developed and sold or used by the lessee for any purpose other than the operation of the plant."

While the charge or rental was at the discretion of the Secretary, there is a further reason which is not given by Mr. Pierce which seems to be as strong perhaps as those offered by him for the elimination of this particular clause. If the charge is to be made for power developed and sold or used, it would allow a speculator to hold an undeveloped site for an indefinite time without any charge being made unless such a regulation as is in force at the present time in the Forest Service was put in effect.

Again, in Section 8, the last proviso as follows:

"Provided further that leases for the development of power by municipal corporations for muncipal use shall be issued without rental charge."

This brings up immediately the definition of "municipal corporations" and "municipal use of power." In a few isolated cases in this country, cities have developed power for purely municipal purposes, that is, for the lighting of their streets and public buildings and for such other purely municipal purposes as it might be needed. It certainly does not mean the use of power in competing with a commercial company for commercial business in a community.

Practically all of the municipal plants in this country, and without question all of the larger ones, enter the commercial field and compete with existing commercial companies for residence lighting, commercial lighting and industrial power. Where this is done there should be no question but that the municipality should be required to pay the same charge that would be required of a public utility company or an individual.

Yours very truly,

July 29, 1915. ALTON W. LEONARD,
President Puget Sound Traction, Light & Power Co.

ELECTRIC SIGNS AS BUSINESS BUILDERS.

BY T. W. SIMPSON.

(Concluded.)

Profit from Sign Campaigns.

An estimate or typical order taken by a representative and turned in to the power company would be as follows:

Investment.		Operation.	
Sign	$120.00	88 lamps.	
Panels	7.00	5 watts each.	
Transformer	10.00	440 installed wattage.	
Amount of manufacturer's invoice	$137.00	5 hours per night.	
88 lamps at .27	23.80	2220 watt hours per night.	
Freight	4.00	30 days per month.	
Erection	30.00	66.6 kw.-hr. per month.	
Total investment	$194.80	7 cents per kw.-hr.	
Interest	19.48	$4.66 per month for energy.	
	$214.28	1.76 per month for renewal of lamps.	
Divide by 60		3.58 per month instalment on investment.	
Monthly payment, $3.58.		$10.00 total monthly payment.	

In the 60 months payment period of this contract the gross returns would be $600 which would include the retirement of the investment. A profit of at least 1 cent per lamp per month is made on lamp renewals, and there is a profit on the original installation of lamps.

The net profit is derived as follows:

Gross Income.. 600.00	Investment as figured	$194.80
	Deduct profit on original lamps	7.00
		$187.80
	Cost of lamp renewals and service installing	53.00
	Base cost of 4000 kw.-hr. of energy at 2c	80.00
		$320.80
	Net profit	$279.20
		$600.00

It is observed the profits on lamp renewals and initial lamp investment plus interest is not far from the base cost of energy at 2 cents per kw.-hr., which justifies the net profit rate at $279.20 divided by 4000, equals 7c per kw.-hr. average net profit.

The above is an example of the case of an average sign with 5-watt lamps. In case the 10-watt lamp, or the new 110 volt 7½-watt lamp is used, the profit increases. The best result is obtained by the use of the 10-watt lamp, but reduce the rate accordingly.

Averaging the results of sign campaigns in many Pacific Coast towns and deducting the loss of profits due to defaults of contract, viz: 1 default per annum per 20 signs, the expectation of results is as follows:

as a basis for calculations by any interested power company manager, as to what may be done on his property by a term payment sign campaign.

The property of one western power company, when evaluated according to this table, shows the reasonable expectation of sign load to provide a net profit possibility of $300,000 per year, but this staggering total should not deter the management of even the smallest single town property from undertaking the term payment plan. Isolated cases are found

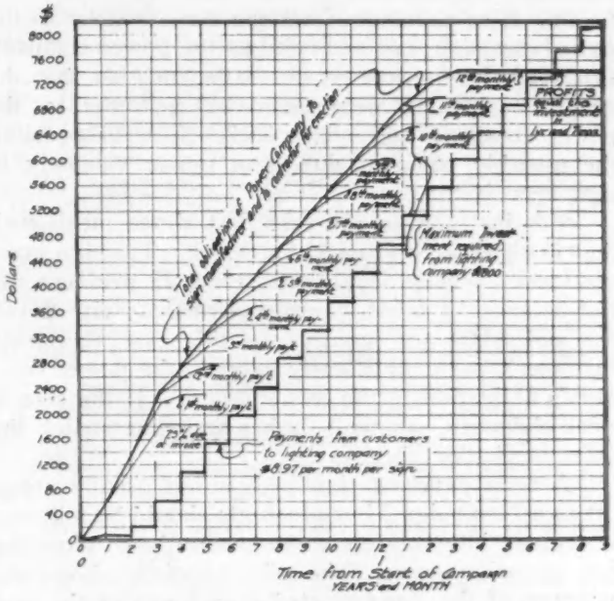

$
Dollars
Time from Start of Campaign
YEARS and MONTH
Payments from customers to lighting company $8.97 per month per sign.
PROFITS equal 15% investment in 1st and 2nd years.
Maximum investment required from lighting company $1800

Chart showing how $1800 invested by a power company will put 50 electric signs on its lines, erected, connected and burning on the deferred payment plan. If these signs were purchased for net cash, the investment would be $7500.

where towns have fifty per cent more than the sign load indicated in the above table, but average results are as shown. As a rule, results from California towns seem to show they offer somewhat better possibilities than Oregon or Washington towns, but it is questionable whether this is not more an indication of the character of salesmanship employed than inherent in the territory.

Reduction of Investment.

It is an easy step from the consideration of the profit from the term payment sign load to the determination of the amount of investment needed to successfully operate the proposition.

Table Showing Expected Number of Signs, Average Gross and Average Net Incomes, Allowing for Average Number of Defaults, for Term Payment Sign Campaign—Averaged from Pacific Coast Conditions.

Size of Town.	Number of Signs.	Gross Income per Year.	Net Profit per Year.	Reduction due to Defaults. per Year.	Net Profit Deducting Defaults. per Year.	Peak Load kw.
500	3	$ 360.00	$ 170.00	$ 19.00	$ 151.00	1.3
1,000	5	600.00	340.00	31.00	309.00	2.2
1,500	8	960.00	445.00	49.00	396.00	3.5
2,000	10	1,200.00	560.00	61.00	499.00	4.4
3,000	15	1,800.00	840.00	92.00	748.00	6.6
5,000	20	2,400.00	1,120.00	123.00	1,097.00	8.8
10,000	40	4,800.00	2,220.00	246.00	1,974.00	17.6
25,000	125	15,000.00	7,000.00	770.00	6,230.00	52.8
40,000	200	24,000.00	11,000.00	1,230.00	9,770.00	88.0
100,000	400	48,000.00	22,000.00	2,460.00	19,540.00	176.0

No better evidence of the intrinsic merit of a sign load can be offered than this table. What other form of power company activity will bring a net profit of $1200 per year from 10 kw. peak capacity—requiring no meter or line investment? The table can be used

The natural supposition would be that the power company would purchase the signs outright from reputable manufacturers and sell them to consumers. This requires complete investment for sign, erection, and selling expense. This was current practice in the

early days of the electric sign industry in the East, and in addition sign companies were subsidized or financed by power companies, so valuable was this load considered.

The next development was for the manufacturer to sell the sign for the power company, thus eliminating investment in selling expense to the power company.

Finally the sign manufacturer now practically finances the investment by the simple expedient of extending term payments from the manufacturer to the power company; not as liberal as the power company extends to the customer, but sufficiently so that the gross monthly payment made by customer to the power company will come fairly close to equaling the monthly payment due from power company to sign manufacturer.

For instance, in the case first above mentioned, the customer pays gross $10 a month. The sign manufacturer's invoice is $137.00, terms 25 per cent net and balance 12 equal monthly payments; viz: $34.00 net and $8.60 per month. In this case the gross customer's payment slightly exceeds the power company's obligation to the manufacturer. If the sign is more elaborate, say with flasher and time switch the difference is the other way.

A term payment sign proposition usually starts out as a "campaign," but prospects should be followed at regular intervals on a permanent basis after the first campaign closes. The influence of the showy appearance of the signs erected as a result of the first campaign is a powerful aid to whip the laggards into line. There are always new prospects, and sign interest should not be allowed to drag. In case a customer is inclined to default, the continued presence of the sign salesman will be an aid in convincing him his sign is the very last sacrifice that should be made, quite as necessary to him as his telephone, etc.

Nor should the signs be neglected after being fully paid for. A little attention will keep the customer satisfied for years after the five year term is up. If the right kind of a sign is chosen as the basis of the campaign, a useful life of 15 or 20 years should obtain—and the sign become a steady consistent revenue producer.

The life of wood pipe varies from four to twenty-five years, according to treatment and variety of wood. Uncoated fir pipe buried in tight soil has lasted twenty years, whereas it lasts but from four to seven years if buried in loose soil and from twelve to twenty years exposed to the air. Fir pipe well coated lasts twenty-five years if buried in tight soil and fifteen to twenty years in loose soil. Uncoated redwood pipe will last more than twenty-five years in tight soil. These estimates have been made by D. C. Henny, consulting engineer, U. S. Reclamation Service, upon the assumption that continual water pressure is maintained. Wood-stave pipe is not suitable where it cannot be kept full and under pressure. Coating should be continuous and not less than one-sixteenth inch, and should consist of several individual coats of asphaltum and tar on an application of gas tar, followed by one more application of refined coal tar.

THE SALINE METHOD OF WATER FLOW MEASUREMENT.

By W. D. PEASLEE.[1]

During the past three years the author has found it necessary to measure the flow of water in streams and pipe lines under many different conditions and often under circumstances that required great accuracy of results. The expense and general inaccuracy of the methods commonly employed led to an investigation of the subject with the object of discovering some method that would be reasonable in expense and would give dependable results in the hands of the average engineer.

It was obvious that some method which did not depend on the cross section of the channel was required; so methods depending on the velocity of flow were not to be considered. Attention was then turned to the chemical methods; and, as the methods then in use were not satisfactory in that they were expensive and required the services of an expert chemist in their manipulation, the study was taken up to develop a method that filled the requirements of the practicing engineer as to simplicity and accuracy.

Theory.

If we take a large volume of pure water and add to it a small amount of chemical solution, such as common salt (NaCl), of known saturation, since the amount of chemical in the two cases is the same, we can write:

$$V_0 S_0 = (V_2 + V_0) S_2, \text{ or } V_2 = V_0 \left[\frac{S_0}{S_2}\right] - V_0 \ldots (1)$$

V_0 = Volume of dosing solution.
V_2 = Volume to be measured.
S_0 = Salt per unit volume in dosing solution.
S_2 = Salt per unit volume in mixture.

The solution of this equation will then give the volume of pure water to which the chemical solution was added. If, however, this volume to be measured contains some of the chemical used in the dosing solution this content must be determined. Calling this S_3 we can then write:

$$(V_0 S_0 + V_2 S_3) = (V_0 + V_2) S_2,$$

$$\text{or } V_2 = \left[\frac{S_0 - S_3}{S_2 - S_3}\right] V_0 \ldots\ldots\ldots\ldots (2)$$

S_3 = Salt per unit volume in water to be measured.

These equations result simply from the fact that the total quantity of chemical is the same after mixture as before.

Now refering this condition to a stream of constant flow, if the solution be introduced at a definite constant rate q, and thorough mixture be secured, it is evident that the relation between the volume of water in the stream, passing any section in any given time, and the volume of dosing solution introduced in that time is indicated by the above equation. Expressing these quantities in terms of discharge the equation becomes:

$$Q = \left[\frac{S_0 - S_3}{S_2 - S_3}\right] q \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Q = Discharge of stream in any convenient units.
q = Dosing rate in the same units.

[1] Consulting engineer, Portland, Ore.

S_0 = Salt per unit volume dosing solution.
S_2 = Salt per unit volume in stream after dosing.
S_3 = Salt per unit volume in stream before dosing.

Now if we wish to measure the flow of a stream such as the discharge of a pump, where the pump is used as the mixing agent, with the dosing station near the intake and the sampling station near the discharge we find that the discharge of the pump includes the dosing flow, and the equation representing the discharge becomes:

$$Q + q = \left[\frac{S_0 - S_3}{S_2 - S_3}\right] q \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

If the water be initially free from salt the analysis shows $S_3 = 0$ and the discharge is then shown by the equation

$$Q + q = \left[\frac{S_0}{S_2}\right] q$$

at the sampling station and

$$Q = \left[\frac{S_2}{S_0}\right] q - q$$

at the dosing station.

It is obvious that the validity of this relation depends in no way on the cross section area of the stream or on any determinations of water velocity. We have then a method which for its accuracy depends on the accuracy with which we can determine the following conditions:

1. Determine the amount of salt per unit volume in the samples taken.
2. Determine and maintain a constant dosing rate.
3. Secure a perfect mixture of the dosing solution and the water of the stream to be measured.

Method.

Analysis.—Taking these requirements in the order given it is obvious that a quantitative gravimetric analysis of the samples will give the required information. This analysis, however, is a difficult one and requires the services of an expert chemist.

If the dosing solutiion be common salt (NaCl), we can determine in a relative way, the amount of salt per unit volume in each sample by precipitating the salt with silver nitrate ($AgNO_3$). The volumes of the silver nitrate solution required to precipitate the salt in the samples will be in the same ratio as the total salt in the samples. Therefor, if we treat equal volume samples, the volumes of silver nitrate required to precipitate the salt in the various samples will be in direct proportion to the salt per unit volume in the samples.

In the practical use of the precipitation method it is necessary to use a reagent as an indicator to show when the precipitation is complete by the change of color of the solution. Potassium bichromate is the reagent commonly used. In this case a certain excess of the silver nitrate solution is required to act on this indicator to change its color and, in very accurate work, account must be taken of this. This excess has been found to depend, for all practical purposes, on the volume of solution treated and the amount of indicator present. If then, we treat equal volumes of the samples, and use in them equal volumes of the indicator, the excess will be the same in all cases; and, as will be shown, it will cancel out of the equation.

We find, then, that when the samples treated are of the same volume and the amounts of indicator are the same in each the following conditions are fulfilled.

1. The volumes of silver nitrate required to precipitate the salt in the different samples are in direct proportion to salt per unit volume in the samples.
2. The excess silver nitrate required to react on the indicator is the same in each case.

Bearing these points in mind, we can rewrite equation (4) as follows:

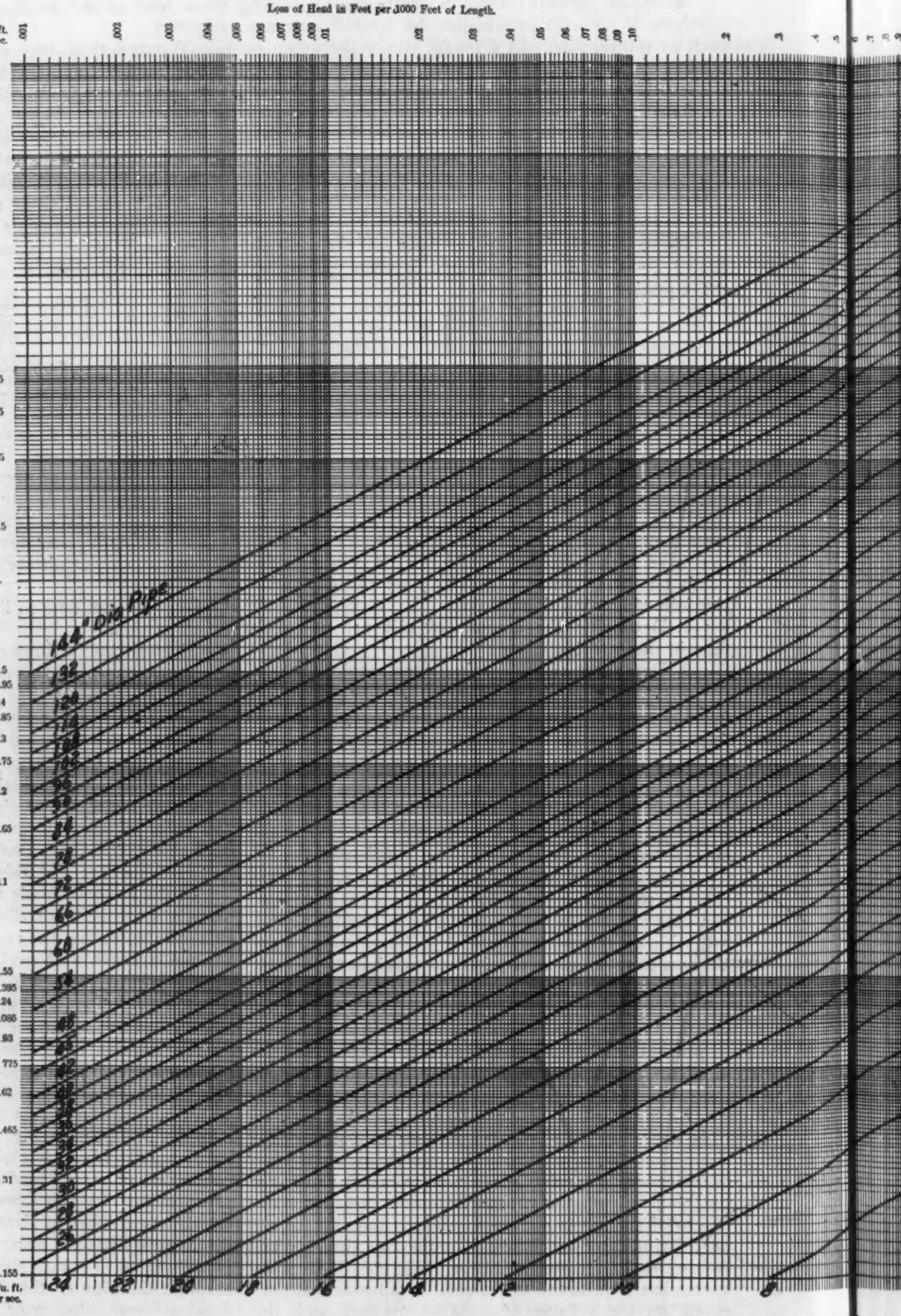
$$Q + q = \left[\frac{(V_0 + X) - (V_3 + X)}{(V_2 + X) - (V_3 + X)}\right] q = \left[\frac{V_0 - V_3}{V_2 - V_3}\right] q \quad \ldots\ldots\ldots\ldots\ldots (5)$$

V_0 = silver nitrate to precipitate the salt in one litre dosing solution.
V_2 = silver nitrate to precipitate the salt in one litre sample after dosing.
V_3 = silver nitrate to precipitate the salt in one litre sample before dosing.
X = excess silver nitrate to react on indicator in each case.
$Q + q$ = stream flow in litres per second at sampling station.
q = dosing rate in litres per second.

Remembering that the volume of silver nitrate used to precipitate the salt in the solution and change the color of the indicator in each case represents $(V_0 + X)$, $(V_2 + X)$ and $(V_3 + X)$, respectively, we see that the above equation is still valid when for V_0, V_2, and V_3 we substitute the volumes of silver nitrate required to precipitate the salt and change the color of the indicator. Experiment has shown that this excess is so small that it is almost impossible to detect it; and this fact renders the practical use of the method simple as will be shown later, since titrations can be made of dilutions and concentrations of the samples and the results reduced to the original sample strength with negligible error. A further discussion of this analysis will be taken up later.

Dosing.—Turning now to the second requirement it is an easy matter to secure a constant flow of dosing solution by means of a standard orifice calibrated with the dosing solution and used under constant head. Calibration of the orifice with any pure water is accurate within an entirely negligible error. The device shown in Fig. 1 has been used with excellent results. It consists of a box with a long weir on one side and a pipe leading from the bottom. Caps are provided for the lower end of the pipe, each of which has a different sized hole, thus giving different discharges with the same equipment. The solution is allowed to flow into the weir box, part flowing out through the pipe as the dosing solution and the rest flowing over the weir to be returned to the supply tank. By keeping the head over the weir

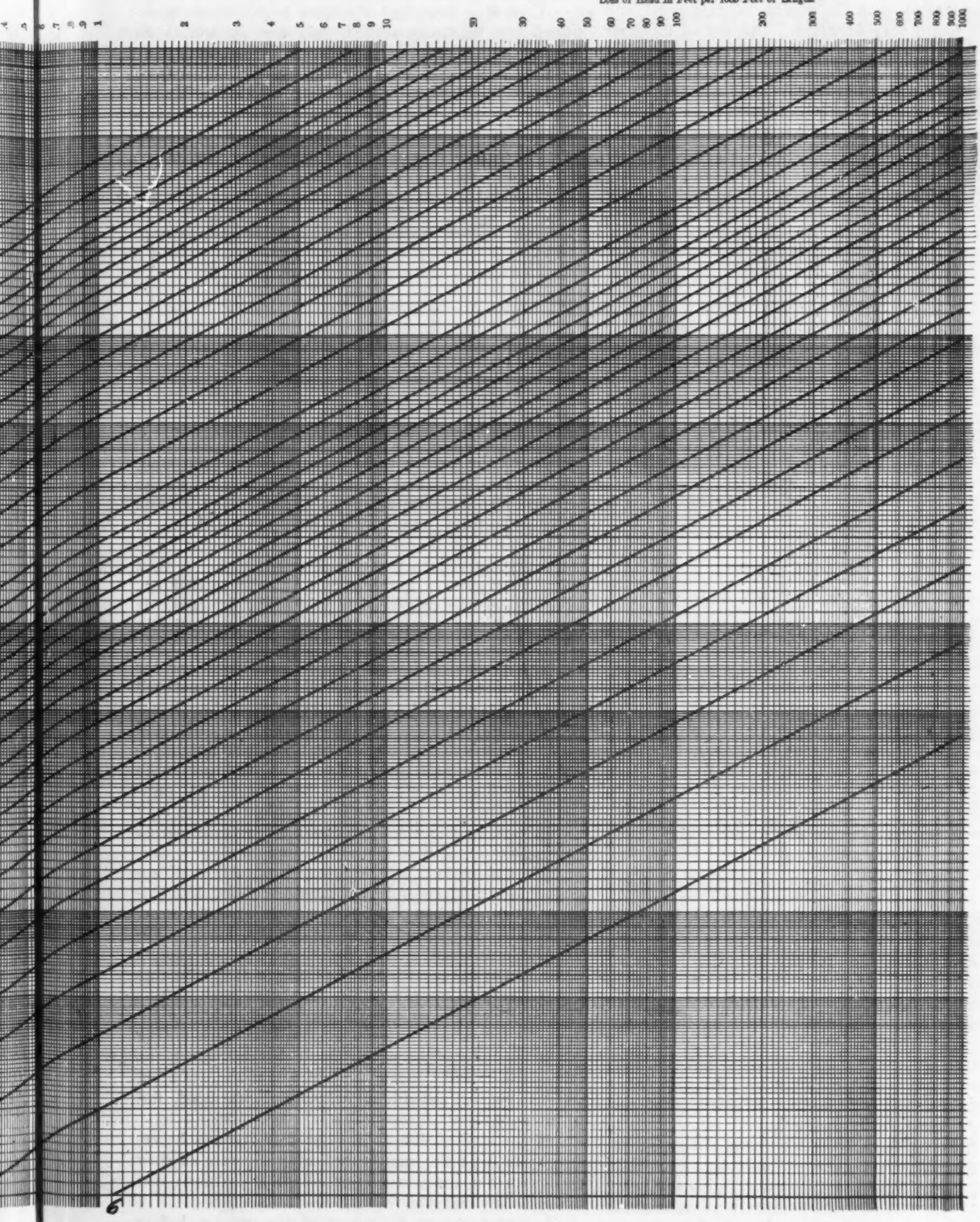
CHART FOR GRAPHIC DETERMINATION OF FLOW O WAT



C = 90, corresponding to sm pipes.

WATER IN PIPES BY HAZEN & WILLIAMS FORMULA. PREPARED BY GEO. J. HENRY.

Loss of Head in Feet per 1000 Feet of Length.



to small pipes.

constant by means of a hook gage the head over the orifice in the pipe cap is kept constant and a uniform dosing rate is secured. The different orifices are calibrated, preferably with the dosing solution used, and have been found very accurate. The use of the weir has been deemed advisable as it acts as a guard against momentary inattention on the part of the operator attending to the maintenance of the water level. If, for any reason, the flow into the device from the storage tanks is increased the weir will prevent any great increase in head over the orifice; and, within commercial limits, will hold the dosing rate constant over a considerable range of inflow from the tanks.

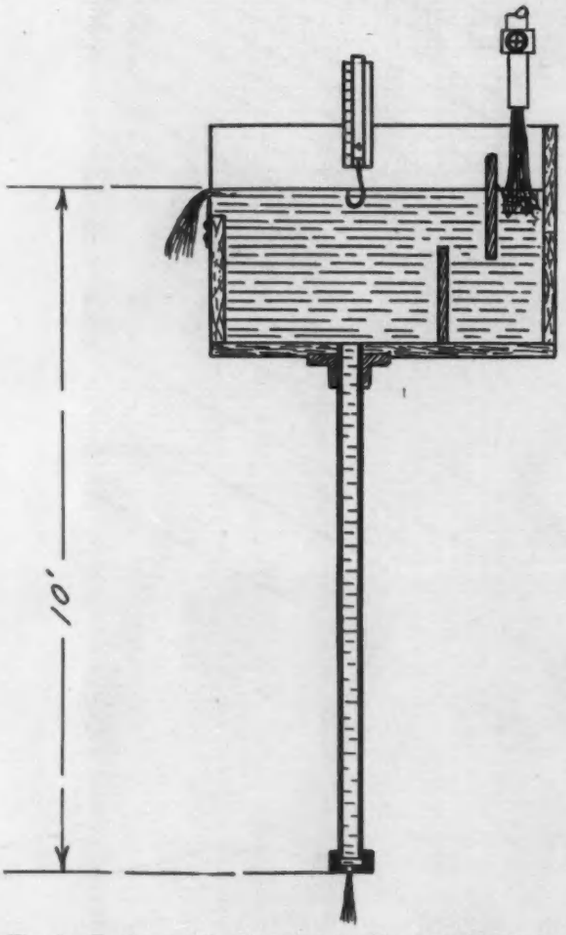


Fig. 1. Equipment for Securing Constant Dosing Rate.

With this device it has been found easy to maintain and know the dosing rate over wide ranges within an accuracy of better than 0.1 per cent. In the dosing of large streams, where the dosing solution might be pumped into a large perforated pipe, other means may be devised for measuring and maintaining the dosing rate.

Mixture.—A great many tests have been conducted to determine the requirements for securing a perfect mixture and it is fortunate indeed that this requirement is so easily secured.

It has been found that any pump, rotary or reciprocating, will effect a perfect mixture, as will of course any water wheel or turbine. A pipe discharging into a basin or ditch also gives perfect mixture and in a flume two baffles placed as in Fig. 2 have proved entirely efficient in this respect. A small stretch of rapids or a water fall has in small streams proved effective and should, with proper dosing methods, be found effective in large streams.

Thus it is seen that the three requirements mentioned can be easily and cheaply met in almost all cases.

Equipment.—The equipment required, aside from that used in introducing the dosing solution, is simple and inexpensive. The manipulation is of such simplicity that untrained operators can, by following directions, secure reliable and consistent results.

The dosing rate, and so the amount of salt solution required to run a given test, depends on the rate

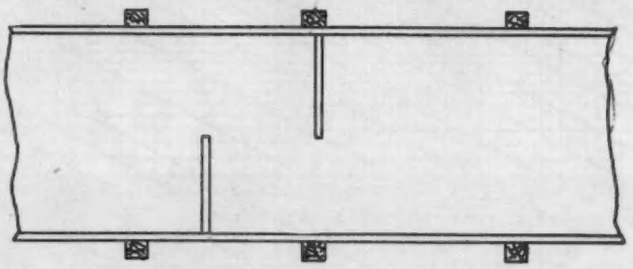


Fig. 2. Mixing Baffles in Flume to Insure Thorough Mixture.

of flow of the stream to be measured, the governing requirement being that enough salt is secured in the sample to give accurate results. That is, the volume of silver nitrate required to precipitate the salt in the sample must be great enough to be measurable to the degree af accuracy required of the test. With a magnifying glass a burrette can be read to 0.01 cc., so ten cc. can be measured to within 0.1 per cent. It has been found from practice that using practically saturated salt solution and the strength reagent hereinafter described, a dosing rate of about 15 gallons per minute for each 100 second feet of flow to be measured gives very good results. It should be remembered that the particular value of the dosing rate is not material as long as it is accurately known and maintained constant. Dosing need be continued only long enough to insure that the salt solution has reached the sampling station. When samples are taken dosing may be stopped, so the amount of salt required is not so great as would at first thought be supposed.

Thus to make a ten minute test on a flow of approximately 100 second feet requires about 150 gallons of salt solution.

In the case of a turbine where the dosing solution is introduced in the penstock and the sample taken in the tail-race it requires only a few moments for the salt to appear at the discharge and so this amount of salt solution will give several determinations. As it is seldom necessary to locate the dosing and sampling stations at any great distance apart, the salt dosed in will appear very quickly at the sampling station; so the individual determinations need not cover more than a few minutes in most cases.

If the rate of flow is not constant it must be remembered that the sample indicates the rate of flow at the instant the water from which it is taken was passing the dosing station.

Samples should be taken of the stream before dosing, the dosing solution, and the stream after dos-

ing, being kept in clean jars or bottles with effective stoppers. After sealing, the jars should have their stoppers dipped in hot pitch or wax to insure thorough sealing and prevent evaporation of the sample before it can be tested. Of course if the analysis is to be performed at once this precaution is unnecessory.

For carrying out the test by the precipitation method the following equipment will be required:

3 calibrated burrettes, 25 or 50 cc.
1 burrette stand.
1 calibrated one litre flask.
1 magnifying glass for reading burrettes.
2 two litre beakers.
6 200 cc. beakers.
1 white porcelain plate 6 in. x 6 in.
Two or more evaporating lamps, bunsen burners or similar.
About 200 cc. normal potassium bichromate solution.
About one litre normal silver nitrate solution.
Distilled water; about two gallons will be required for each test.

Procedure.—Be sure all apparatus is clean. Place in one of the burrettes a solution of potassium bichromate made up of about ten parts of distilled water and one part of the normal solution.

Prepare in one of the two litre beakers a solution of silver nitrate about one part normal silver nitrate solution and ten parts of distilled water. Be sure to prepare enough of this solution, as the same solution strength must be used throughout the test. About one litre of the dilute solution is enough for any ordinary set of samples. This solution is to be used in the second burrette for precipitation of the salt in the samples.

By means of the third burrette, measure accurately into the calibrated litre flask 10 cc. of the dosing solution and add distilled water to make up the litre; then measure out accurately 10 cc. of this solution into one of the small beakers. Add to this 1 cc of the potassium bichromate solution from the first burrette; then add drop by drop the silver nitrate solution from the second burrette. Continue this, agitating the treated sample constantly, until the first persistent brownish color appears. A little practice will enable one to detect this change with great delicacy. The white porcelain plate should be used under the beaker to assist in detecting this color change. Since, due to the dilution of the sample, the solution in the beaker contained one ten thousandth of the salt in a litre of the dosing solution, we multiply the volume of silver nitrate used by 10,000 and the result is V_0 which is proportional to the amount of salt in one litre of the dosing solution. The dilution of the dosing solution is simply to avoid using an excessive amount of the silver nitrate to precipitate the salt in this strong solution.

Evaporate one litre of the sample of the water before dosing to 10 cc., add 1 cc. of the potassium bichromate solution and titrate as described above. Since this sample contained all the salt in one litre of the water before dosing, the volume of silver nitrate used is proportional to the salt in one litre of the water before dosing, so is V_2.

Evaporate 50 cc. of the sample taken after dosing to 10 cc. and titrate as above described. Since the 50 cc. sample contained one-twentieth of the salt in a litre of the water after dosing, we multiply the volume of silver nitrate used by twenty and the result is V_2, which is proportional to the salt in one litre of the water after dosing.

Always use the same burrette for silver nitrate solution and when using equipment for different solutions be sure and clean thoroughly before proceeding from one to the other.

Q and **q** in litres per second are thus obtained from equation (5).

As a sample of one test taken, the following results were obtained, measuring the discharge of a large centrifugal pump. Discharge, as indicated by weir—2745 litres per second, (96.898 sec. ft.) Volume of silver nitrate to titrate dosing solution sample as described, determined independently by two operators:

	96.1 cc.
	95.94 cc.
	95.91 cc.
	96.05 cc.
Average,	96.0 cc.

From this we find $V_0 = 96.0 \times 10{,}000 = 960{,}000$.

V_2 was determined as described to be 20.7.

In the determination of V_2 the following volumes were obtained, three by one observer and two by another.

	17.62 cc.
	17.56 cc.
	17.60 cc.
	17.60 cc.
	17.64 cc.
Average,	17.604 cc.

From this we find $V_2 = 17.604 \times 20 = 352.08$.

The discharge $Q + q = \left[\frac{960{,}000 - 20.7}{352.08 - 20.7}\right] .94{,}625$

$= 2741.34$ litres per sec. (96.769 sec. ft)

The close agreement of the values determined for V_0 and V_2 show the accuracy with which results can be duplicated with this method, especially when it is remembered that determinations were made alternately by two different observers and the results were not compared until after all the determinations were made. The dosing station in this case was at the pump intake and the sampling station was eighty feet away at the discharge. Two hundred gallons of salt solution were used in this test and six tests were taken, three at the discharge indicated above and three at approximately half that discharge.

The metric system of units has been used throughout this paper to secure simplicity of computation.

It has been found that the use of ordinary commercial rock salt for making up the dosing solution is entirely satisfactory as the error introduced by its use is less than 0.1 per cent.

A large number of tests on discharges ranging from a few gallons per minute to 150 second feet, and under widely variant conditions of mixture, indicate that with proper care this method will give results within 0.1 per cent consistently; and, with a very little practice any ordinarly intelligent operator can become expert in the performance of the test.

[To be continued.]

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Maintenance of Resale Prices

Hope of final favorable action in the present campaign to legalize maintenance of the resale prices is inspired by a recent decision of the Federal Court for the district of New York. In this case calling for adjudication under the Clayton Act, the opinion denies the right to compel, by preliminary injunction, the manufacturer to sell merchandise to a person who does not maintain the established resale price. It furthermore denies the right to compel a sale at prices other than those set by the manufacturer. Although this decision lacks the force and effect of a final judgment because it is merely the outcome of a preliminary hearing it augurs well for the bill corresponding to the Stevens Price Maintenance Bill which will undoubtedly be introduced in the next session of Congress.

Meanwhile it is advisable to continue to enlighten the public regarding the evils of price cutting. While the manufacturer who names the price at which his product shall be sold must suffer the immediate penalty of the law the ultimate sufferer is the consuming public.

The best argument to convince a dealer of the evil of price cutting is based upon the effect it will ultimately have on his own business. Price cutting, in the eyes of the average buyer, cannot help but suggest some corresponding reduction in quality or service. For every buyer who has learned the value of an established article because of the satisfaction which has accrued from purchase in the past, there are ten prospects who are almost ready to buy. Price cutting suggests quality cutting. So that what little is gained by selling to those who know the value is more than offset by the loss of confidence among prospective buyers.

A standard price obviates the necessity of a purchaser's having to bargain. This gives confidence and saves time. Haggling over prices is a characteristic of the Orient that is entirely inconsistent with modern business methods of the Occident. No matter how low the final price there always remains a suspicion that someone else might have bought it cheaper.

Attempted substitution of inferior goods invariably results when standard articles are advertised at cut prices. This cheats the unsophisticated customer. Where price cutting does not bring and hold the trade anticipated (people who will also buy other goods upon which there is a good profit) the dealer discards this leader and tries another. This cheats the customer and also the manufacturer who had created and developed the market.

Any dealer who really understands the power of advertising in creating a market will not cut prices. A business built on cut prices is like a house built upon the sands. But a business built upon service is a house established upon the solid rock of satisfaction and confidence.

Another instance of the necessity for price maintenance is found in the sale of electric appliances by central stations. Here the reason is not so much for the protection of the manufacturer or the consumer as it is for the central station. Experience in California is demonstrating that all electrical interests will gladly co-operate with a central station in its effort to increase the load on its lines if appliances are not sold at cut prices. The co-operation and good will of several dealers in a town is worth more to the central station and in the end will place more devices on the line than will a policy of price cutting.

The Influence of Load Factor

It is sometimes hard for the average man to understand why a low load factor tends to increase the rate he should pay for electric service. One way in which this can be made clear is to show him how load factor affects the cost of supplying electric power. This is knowledge that every electrical salesman should possess.

Load factor may be defined as the ratio of the average power consumption of an installation to the maximum. This fraction is expressed as a percentage; thus a fifty per cent load factor means that the average consumption is one-half the maximum.

An electric plant differs from a gas or water plant in that enough generating equipment must be installed to take care of the maximum demand at any instant. Whenever the demand is less than the maximum the generating equipment is idle. But the greater part of the cost goes on just the same as when the plant is running at full capacity.

The cost of power, like Caesar's Gaul, is divided into three parts. A small part is proportional to the amount of power used, a larger part depends upon keeping a steam reserve to a hydraulic supply, but the greatest part is the fixed cost, which continues whether the plant is loaded or not. This fixed cost includes the interest on the investment, maintenance and depreciation, salaries and other overhead expenses.

From this it is seen that the lower the load factor, the higher is the cost of power. Thus it costs more to supply power to a two hundred horsepower laundry installation, when the load factor may be only twenty per cent because of intermittent use of the motors, than to a two-hundred horsepower refrigerating plant, where the load factor may be fifty per cent.

The load factor influences the operating costs as well as the fixed costs. In a modern steam turbine plant each five per cent increase in load factor represents about 0.4 per cent increase in efficiency. This, of course, directly affects the cost of fuel. Experience has also demonstrated that other operating changes grow in even greater proportion as the load factor decreases, so that, within the limits of load factors usually attained in the West, each per cent increase in load factor represents one per cent decrease in the total cost of operation. Below thirty per cent load factor the corresponding increase in cost of operation is much more rapid.

The load factor of a power plant is a composite of the load factors of the individual consumers. When these consumers require current at different times it is possible for the same equipment to serve their needs if their demands do not overlap. Diversity of consumers thus introduces a new element, the diversity factor, which makes possible a lower rate to all consumers.

This diversity factor may be defined as the ratio of the sum of all individual maximum demands to the maximum demand of the entire system. As the maximum demands of all consumers are not simultaneous, a large diversity factor increases the load factor and thus decreases the necessary station capacity and corresponding investment.

Finding a Market for Engineering Talent

The apparent surplus of engineers is largely due to their inability to find or develop a market for their services. Since hostile legislation and small return on invested capital has withheld money from many projects of an engineering nature, many a good engineer has had to live on past earnings or take up other lines of work. This is unfortunate for the world is in need of engineering knowledge and training in many lines of endeavor. But until the world knows what the engineer can do, most of his ability, knowledge or training goes for naught.

The problem is essentially one of finding a group of men who will appreciate and value his work and possess the means for paying him. The more men who know that he posseses the qualities which can be of service to them the larger his market. This acquaintance or knowledge depends upon reputation.

Reputation, in turn, is largely a matter of salesmanship, getting others to believe that he has something that they want. This ability is what distinguishes a successful engineer from many of his unsuccessful brethren. Reputation is not inherent in a man, but is what people say about him and to whom they say it. Others may be better engineers but the world recognizes only the man whom they know by reputation.

One of the best ways for a man to gain a reputation is by writing for publication in those magazines which are read by possible employers. A study of the back files of the engineering periodicals will demonstrate that the prominent engineers of today are those who were contributing to the technical press fifteen or twenty years ago. The same opportunity exists today.

Engineers can also gain reputation by taking an interest in civic affairs. The next ten years should witness a great advancement in the efficiency of municipal undertakings and it will be the engineer's own fault if he is not coupled up with this movement. Enough has been said to suggest that reputation rests upon confidence, and confidence is publicity. The value of these suggestions resides only in their immediate personal application.

PERSONALS

J. A. Henning, city electrician of Lodi, Cal., was a visitor at San Francisco during the week.

F. H. Lohman, an electrical dealer of Douglass, Ariz., is spending a few days at San Francisco.

Wm. Bromley of the Ukiah Electric System was a visitor at San Francisco during the week.

R. Q. Cleavenger of the Phoenix Glass Company, Pittsburgh, Pa., is a visitor at San Francisco.

Guy Rose of Moore, Rose & Company, Healdsburg, Cal., spent a few days at San Francisco during the week.

W. H. Fowler of the Sacramento Valley Irrigation Company, Willows, Cal., was a recent visitor at San Francisco.

E. C. McBrearty of the American Electric Heater Company, Detroit, Mich., spent the past week at San Francisco.

R. M. Alvord, manager of the supply department, General Electric Company, San Francisco, is on a business trip East.

J. E. Davidson, vice-president and general manager of the Pacific Power & Light Company of Portland, is at San Francisco.

K. G. Dunn, vice-president of Hunt, Mirk & Company, San Francisco, is on a business trip to Los Angeles and southern California.

F. W. Mielenz, manager of the Napa Valley Electric Railway, St. Helena, Cal., spent a few days during the week at San Francisco.

P. H. Affolter of the Fairbanks-Morse Company, San Francisco, Cal., is on a business trip through the Sacramento Valley, California.

F. W. Eastman of the Stanley & Patterson Company, New York City, was a visitor at San Francisco on a business trip of the Pacific Coast.

J. L. White, manager of the Albany Power Company, Albany, Oregon, has been elected vice-president of the Albany Merchants' Association.

J. A. Sines, traveling representative of the Illinois Electric Company, has returned to Los Angeles after a successful business trip through Arizona.

E. G. Hopson, former supervising engineer of the U. S. Reclamation Service, at Portland, has opened offices as hydraulic engineer, Central Building, Portland, Ore.

M. C. Morrow of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is an arrival at San Francisco this week on a tour of the Pacific Coast.

C. F. Gilchrest, in charge of the motor department of the San Joaquin Light & Power Corporation, spent a few days during the week at San Francisco on business of his company.

A. N. Palmer of the Phillips Insulated Wire Company, Chicago, who is making a trip through Europe and the Orient, is expected to arrive at San Francisco the first of the month, enroute home.

Alfred Karge, manager Nevada Telephone Supply & Construction Company, and Nevada Consolidated Telephone & Telegraph Company, Carson City, Nev., was a visitor at San Francisco during the week.

E. N. Hurley, vice-president of the Federal Trade Commission, and president of the Hurley Machine Company, Chicago, Ill., arrived at San Francisco the first of the week on a tour of the Pacific Coast.

B. S. Sant, who has been for some time past connected with the Wagner Electric Company at St. Louis, Mo., spent a few days the past week at San Francisco enroute to his home at Bombay, India, where he will represent the Wagner Company.

R. A. Griswold of the A. G. Electric Company, Seattle, is a recent arrival at San Francisco, where he expects to represent that company, while **B. A. Hansen,** the San Francisco representative, is making a trip to Seattle and the Northwest.

Carl Young, general manager of the Southern California branch of the Illinois General Electric Company, has returned to Los Angeles after a three weeks' business trip to Chicago and other cities in the Middle West.

Harris J. Ryan, A. H. Babcock and **H. A. Lardner** have been appointed as representatives of the American Institute of Electrical Engineers upon the San Francisco committee of management for the International Engineering Congress. This has been made possible by the recent decision of the institute to take full participation in the congress and by the resignation of **A. M. Hunt,** due to his removal to the East. These appointees, together with **J. T. Whittlesey,** previously appointed, complete the institute's representation.

MEETING NOTICES.

N. W. Electric Light and Power Association.

The eighth annual convention of the Northwest Electric Light & and Power Association will be held in Portland, Oregon, September 8, 9, and 10, 1915. The convention headquarters will be at the Multnomah Hotel. A good attendance is expected and an excellent program of papers, discussion and entertainment has been provided.

The following is a tentative arrangement of the program:

Wednesday, September 8, 1915. Call to Order, by Franklin T. Griffith, President of Portland Railway, Light & Power Company.

Address of Welcome, by Hon. H. R. Albee, Mayor of the City of Portland.

President's Address, O. B. Coldwell.

Announcements, Report, Secretary and Treasurer.

Paper, "The Small Consumer Question," by Hugo Eisenmenger, National Lamp Works.

Paper, "Apportionment as Applied to Analyses of Cost of the Light and Power Business," by J. A. Rockwood, Portland Railway, Light & Power Company.

Paper, "Special Features of Stand-by Steam Power Plant Design and Operation," by E. D. Searing, Portland Railway, Light & Power Company. This paper will be delivered at Station L. and the ladies are invited to attend this meeting.

Thursday, September 9, 1915: Report of Overhead Line Committee, by J. C. Martin, Pacific Power & Light Company, chairman.

Paper, "Development of Small Motor and Appliance Load," by L. M. Simpson and H. B. Peirce, Spokane, Washington.

Paper, "Determination of Maximum Demand," by V. H. Greisser and H. B. Peirce, Washington Water Power Company, Spokane, Washington.

Paper, "Practical Application of Modern Illumination," by F. H. Murphy and Geo. Kumler, Portland, Oregon.

Friday, September 10, 1915: Report, Committee on Electric Cooking and Heating, W. R. Putnam, Utah Power & Light Company, chairman.

Executive Session. Adjournment.

An automobile trip up the Columbia River scenic highway to Oneonta Gorge is planned for Saturday, September 11, 1915.

In addition a number of features of entertainment have been provided for delegates and ladies.

The regular rate of one and one-third fare for the round trip has been obtained to apply from all points in Oregon, Washington and Idaho, and from Vancouver, B. C., upon the certificate plan. Delegates and visitors should purchase one-way ticket and obtain receipt from the ticket agent and deliver receipt to the secretary at the convention.

WATER POWER CONFERENCE.

Governor Withycombe, ex-officio chairman of the Oregon delegation to the water power conference to be held at Portland, September 21, 22 and 23, has announced a tentative program of addresses and papers for the meeting as follows:

J. C. Ralston, Spokane, "Water Power and Its Relation to National Development"; Samuel H. Piles, Seattle, "State Ownership of Water"; Reed Smoot, Provo, Utah, "Federal Tax on Water Powers"; John D. Works, Los Angeles; George E. Chamberlain, Portland; John H. Roemer, Chicago; Frank H. Short, Fresno, Cal., "The Constitutional Aspects of the Ferris Bill"; William E. Borah, Boise; Wesley O. Jones, North Yakima; Oscar W. Underwood, Birmingham, Ala.; Henry D. Pierce, Seattle; David F. Houston, Secretary of Agriculture; Franklin K. Lane, Secretary of the Interior; Lindley M. Garrison, Secretary of War, "Navigable Stream Water Power Legislation."

It is the intention to make the program as comprehensive as possible and with that idea in mind Governor Withycombe has asked leaders in the water power development of the West for suggestions. He already has received many which he is now considering.

The present plan is to devote a day and a half to the reading of papers and hearing addresses. During the remainder of the conference there will be opportunity for expression of opinion from the delegates to the conference and for others to speak.

In preparing a tentative program the Oregon delegation believes it is desirable to have a basis on which to work when the conference assembles, when it will be possible for the conference as a whole to enlarge this program through its committees as it sees fit.

INTERNATIONAL GAS CONGRESS.

Big preparations are being made to welcome gas men from all over the world in attendance at the International Gas Congress at San Francisco, September 27 to October 1, 1915. This will be the biggest convention of gas men ever held, not only due to its wide representation but also because of the attraction of the Panama-Pacific International Exposition and to the remarkable developments in oil gas manufacture on the Pacific Coast. Special trains will be run from New York and Chicago by way of the points of greatest scenic interest.

The International Gas Congress represents a joint meeting of a score of the great gas associations throughout the world. Its president is Dr. Alexander C. Humphries of New York City and Geo. R. Ramsdell, secretary of the American Gas Institute is also secretary of the Congress. Mr. E. C. Jones of San Francisco, president of the American Gas Institute and of the Pacific Coast Gas Association, has called annual meetings of both these organizations during the week of the congress. Several others, including the National Commercial Gas Association, the Illinois Gas Association, and the Natural Gas Association of America, will also hold meetings at this time.

A comprehensive program of papers has been arranged to cover every branch of the gas industry, commercial as well as technical. Foreign and domestic practice in the manufacture and distribution of gas will be discussed by eminent authorities and much attention will be given to the latest improvements in means of lighting, cooking and heating with gas. Gas lighting at the Panama-Pacific International Exposition and oil gas manufacture will be given especial attention. The program of papers to date is as follows:

Symposium "A review of the Present Practices in the Manufacture and Distribution of Gas by British Undertakings," a contribution from the Institution of Gas Engineers of Great Britain through the late Mr. Edward Allen, engineer of the Liverpool Gas Company, consisting of an introduction and five papers: "Introduction," Edward Allen; "Carbonization," John Bond; "Condensation, Washing and Scrubbing," Dr. W. B. Davidson; "Purification," J. Ferguson Bell; 'Distribution," Walter Hole; "Sale of Gas," F. W. Goodenough.

Paper (title unannounced), Dr. Charles Carpenter.

Symposium on "Illumination," consisting of six papers arranged by Mr. C. O. Bond: "Street Lighting," Geo. S. Barrows; "Office and Store Lighting," O. H. Fogg and Thos. Scofield; "Residence Lighting," W. A. Morris; "Industrial Lighting," R. F. Pierce; "Semi-Public Lighting," T. J. Litle; "Buoy and Car Lighting," George E. Hulse.

Symposium, "Commercial Aspects of the Gas Business," National Commercial Gas Association, under the direction of Mr. C. Willing Hare: "Public Relations," E. N. Wrightington; "Office Management," C. N. Stannard; "Complaint and Order Desk," W. J. Clark; "Commercial Accounting," P. S. Young; "Domestic Fuel Appliances," R. E. Slade; "Domestic Lighting Appliances," J. D. Shattuck; "Commercial Lighting Appliances," E. M. Colquhoun; "Industrial Fuel Business."

"The Development of Water Gas," O. B. Evans.

"Deep Fuel Combustion as Applied in Water Gas Manufacture," Arthur G. Glasgow.

"Modern Coal Gas Processes," The Society of Gas Engineering of New York.

"The Substitution of Heating Value for Candlepower, as a Standard for Gas Quality," R. S. McBride.

"Exposition Lighting," W. D'A. Ryan.

An elaborate program of entertainment toward which $10,000 has been contributed by members of the Pacific Coast Gas Association, has been provided. This will be inaugurated by a reception to the president of the congress and will include many features of particular interest to the visiting members and their ladies. Tuesday evening, September 28, is Gas Night on the Zone, Thursday is the official Gas Congress day at the Exposition when a bronze medal will be presented to President Humphreys and a banquet will be given the delegates in the evening and on Friday night there will be a special illumination and fireworks at the Exposition. In each case automobiles will carry the guests to the grounds and admission will be without charge.

In addition to this a series of automobile rides, lunches, dansants and other entertainment have been provided for the ladies. This includes an "afternoon in Hawaii," and a lecture on "Art of the Expositon.

Ample opportunty will also be given for an inspection of the great Collective Gas Exhibit which occupies ten thousand square feet in the Palace of Manufactures. Here fifty manufacturers of gas appliances have assembled a most interesting display.

OREGON WATER PERMITS.

State Engineer Lewis has granted the city of Newport a permit to use 24 cubic feet of the waters of Spencer Creek. The city proposes to construct a dam 9 ft. high and 301 ft. long, of loose rock filled with earth, with a concrete core. There will be a pipe line 10 miles long connecting at the Newport end with a reservoir. The estimated cost of the work is $24,000.

The Friend Mill & Improvement Company has been given a permit for the use of 15 cubic feet of the waters of Jordan Creek to irrigate 1000 acres of land in the vicinity of Friend, Wasco county. It is also planned to develop 75 horsepower for electric lighting and manufacturing purposes. A ditch and pipe line 8 miles long will be built at an estimated cost of $5000.

RECENT APPLICATONS TO THE CALIFORNIA WATER COMMISSION FOR PERMITS TO APPROPRIATE WATER.

Pacific Power Corporation, Bodie; power; 40 second feet on Leevining Creek, Mono county; diversion, Sec. 16, T. 1 N., R. 25 E., M. D. M.

Pacific Power Corporation, Bodie; power; 40 second feet on Rush Creek, Mono county; diversion, Secs. 20 and 30, T. 3 S., R 26 E., M. D. M.

W. F. Pipher, 1213 South Main street, Los Angeles; irrigation and domestic; 1 cu. ft. spring in Pine Canyon, Sec. 21, T. 7 N., R 15 W.,S. B. M.

Wm. S. White, Beaumont; irrigation and domestic; 25 inches Cherry Canyon; diversion, Sec. 6, T. 2 S., R. 1. E., S. B. M.

W. J. Newenham, Neuralia; agriculture; 5 cu. ft., Red Rock Canyon; diversion, Sec. 11, T. 30 S., R. 37 E., M. D. M.

Monrongo Valley Mutual Water Co., Banning; agriculture and domestic; 2½ cu. ft. Big Morongo Creek; diversion, Sec. 18, T. 1 S., R. 4 E., S. B. M.

John H. Rylands, 603 Pacific Electric Building, Los Angeles; irrigation and domestic; 1 cu. ft. Cold Spring Canyon; diversion, Sec. 8, T. 7 N., R. 17 W., S. B. M.

Webb Bros. Co., Montague; agriculture; 15 cu. ft, Shasta River; diversion, Sec 28, T. 45 N., R 6 W., M. D. M.

The Symmes Creek Dev. Co., Independence; agriculture, Symmes Creek; diversion, Sec. 35, T. 13 S., R. 34 E., M. D. M.

George A. Clark, Bishop; irrigation; 6 cu. ft., Fall Creek and Rock Canyon Creek.

Olaf F. Severson, Fair Oaks; agriculture; 100 cu. ft. American River, Sacramento county; diversion, Sec. 15, T. 9 N., R. 6 E. and Sec. 24, T. 10 N., R. 7 E., M. D. M.

Joseph Giroux, Bishop; mining and power; 3 sec. ft. Piute Creek.

John D. O'Connell, Alturas; agriculture.

Celso Tonella, Modesto; agriculture; 5 cu. ft. Stanislaus River; diversion, NE. ¼ of SW. ¼, Sec. 10, T. 3 S., R. 7 E., M. D. M.

Homer C. Jack, Bieber; agriculture; 4 cu. ft. Willow Creek; diversion, Lot 1, Sec. 2 and NW. ¼, SE. ¼, Sec. 27, T. 38 N., R. 9 E., M. D. M.

Colonel W. Pogue, Susanville; agriculture; 5 cu. ft. Silver Creek; diversion, NE. ¼, NE. ¼, Sec. 20, T. 38 N., R. 17 E., M. D. M.

L. Gilmore et al., Box 688, Nevada City; mining, power and irrigation; 5000 inches Little Green Horn Canyon.

George E. McCoy, Surrey; irrigation; 5 cu. ft. Santa Clara River; diversion, NE. ¼, SE ¼, Sec. 18, T. 4 N., R. 15 W., M. D. M.

Tulare Water Co., 1323 Merchants Exchange Building, San Francisco; agriculture; Kern River through Buena Vista Slough; diversion, NE. ¼, NE. ¼, Sec. 5, T. 26 S., R. 22 E., M. D. M.

D. M. Furnivall, Surrey; agriculture; 7½ cu. ft. Santa Clara River; diversion, Sec. 18, T. 4 N., R. 15, S. B. M.

Sumner B. Wright, San Bernardino; agriculture; Smithson Spring; diversion, SW. ¼, SW. ¼, Sec. 19, T. 4 N., R. 7 W., S. B. M.

W. H. Pauk, Adin; agriculture, 10 cu. ft. Ash Creek; diversion, NE. ¼, NW. ¼, Sec 34, T. 39, N., R. 8 E., M. D. M.

Paul J. Hopper, Bieber; agriculture; 4 cu. ft. Ash Creek; diversion, NE. ¼, NW. ¼, Sec. 34, T. 39 N., R. 8 E., M. D. M.

W. J. Hole and Erle L. Veuve, 631 S. Bonnie Brae street, Los Angeles; agriculture; 17 cu. ft. Santa Ana River.

John Holst, Ferndale; irrigation; 1 cu. ft. Ries Creek; diversion, Sec. 34, T. 3 N., R. 2 W., H. B. M.

Oakdale Irrigation District, 1128 Merchants' Exchange Building, San Francisco; irrigation; 62,836 acre feet; Highland Creek; diversion, SW. ¼, NE. ¼, Sec. 35, T. 5 N., R. 15 E., and Sec. 10, T. 1 S., R. 12 E., M. D. M.

Utica Gold Mining Company and Hobart Estate Company, 1128 Mechants' Exchange Building, San Francisco; power; 62,836 acre feet Highland Creek; diversion, SW. ¼, NE. ¼, Sec. 35, T. 5 N., R. 15 E., and Sec. 10, T. 1 S., R. 12 E., M. D. M.

Andrew Babcock, Bieber; irrigation; 12 cu. ft. Ash Creek; diversion, NW. ¼, NE. ¼, Sec. 34, T. 39 N., R. 8 E., M. D. M.

Alfred Babcock, Bieber; irrigation; 5 cu. ft. Ash Creek.

Earnest G. Babcock, Bieber; irrigation; 5 cu. ft. Ash Creek.

Lorenzo Pilaria, Gray P. O.; agriculture; 25 cu. ft. Mission Creek; diversion, NW. ¼, NW. ¼, Sec. 18, T. 2 S., R. 4 E, S. B. M.

J. W. Thatcher, H. M. Thatcher and H. C. Hansen, 1222 Cole street, San Francisco; mining; Empire Creek; diversion, SW. ¼, SE. ¼, Sec 21, T. 23 N., R. 4 E., M. D. M.

Cabazon Water Co., 403 Columbia Trust Building, Los Angeles; irrigation and domestic; Millard Canyon; diversion, NW. ¼, NW. ¼, Sec. 16, T. 3 S., R. 2 E., S. B. M.

Elbert Howard, Doyle; irrigation; 300 cu. ft. Last Chance Creek; 500 cu. ft. Long Valley Creek and all Red Rock Creek.

Engels Copper Mining Co., 393 Mills Building, San Francisco; power; 1-8 cu. ft. Morton Creek; diversion, NE. ¼, SW. ¼, Sec. 33, T. 28 N., R. 11 E., M. D. M.

W. W. Price, Fallen Leaf, Lake Tahoe; power; all Eau Claire Creek; diversion, SW. ¼, SW. ¼, Sec. 14, T. 12 N., R. 17 E., M. D. M.

Samuel W. Gandrean, 340 K. 61st street, Los Angeles, irrigation and domestic; four springs in San Bernardino county.

John F. Cowan, 331 D. F. Walker Building, Salt Lake City; Head of Dollie Gulch; diversion, W. ½, NW. ¼, Sec. 8, T. 26 N., R. 12 E., M. D. M.

Mrs. Hyrel C. Gill, Millard Canyon, Pasadena; agriculture; 5 cu. ft. The West Fork, and Saucer Canon, and Millard Creeks; diversion, NE. ¼, NE. ¼, Sec. 33, T. 2 N., R. 12 W., S. B. M.

Stuart D. Allen, 329 Eureka street, Redlands; agriculture; White Water River.

C. S. Compton, D. L. Whisman, C. M. Burket, Paradise; agriculture; 75 cu. ft. Little Butte Creek; diversion, NW. ¼, NW. ¼, NW. ¼, Sec. 18, T. 23 N., R. 4 E., M. D. M.

C. S. Compton, D. L. Whisman, C. M. Burkett, Paradise; agriculture; 75 cu. ft. West Branch Feather River diversion, NW. ¼, NE. ¼, NE. ¼, Sec. 1, T. 22 N., R. 3. E., M. D. M.

Harold M. Hall, 733 Central Building, Los Angeles; irrigation and domestic; Rock Creek and Fall (or Silver Fall) Creek; diversion, Secs. 30 and 31, T. 2 S., R. 33 E., M. D. M.

F. G. Brooks and F. H. Brooks, 125 East Fourth street, Los Angeles; irrigation and domestic; Big Tijunga River.

G. W. McCain, Descanso; irrigation and domestic; 2½ cu. ft. creek on La Puerta Ranch.

Wm. F. Erwin, Surrey P. O.; irrigation and domestic; 1¼ cu. ft. unknown spring; diversion, near the center of the W. ½ of the SE. ¼, of SE. ¼, Sec. 19, T. 4 N., R. 15 W., S. B.M.

George Fusenot, Little Lands; irrigation and domestic; 50 inches Wards Canon, Los Angeles County.

Earl R. Caldwell, mine; irrigation; 1 cu. ft. Wilson Creek, Mendocino County; diversion, Sec. 2, T. 24 N., R. 14 W., M. D. M.

J. W. Squires and R. B. Gilmour, I. O. O. F. Building, Stockton; irrigation; 4 cu. ft. Little John Creek, Stanislaus and San Joaquin counties; diversion, NE. ¼, SE. ¼, Sec. 35, T. 1 N., R. 7 E., M. D. M.

Arthur E. Barr, Weldon; irrigation; Mountain spring, tributary Kelso Creek in Kern county; diversion; Sec. 32, T. 27 S., R. 35 E., M. D. M.

NEWS NOTES

INCORPORATIONS.

SAN FRANCISCO, CAL.—Jensen-Pridham Electrical Company of California, $1,500,000, shares $100 each, subscribed $700, by P. L. Jensen, E. S. Pridham, W. A. Breen and Thos. Martin.

PENDLETON, ORE.—Articles of incorporation have been filed for the Vincent Water Company, which will furnsh a city water system for Vincent, Umatilla county. The company is authorized to issue capital stock to the value of $1500, in shares of $5 each. The incorporators are A. T. Smith, J. P. Caldwell, D. J. Kirk and W.F.Gentry.

ILLUMINATION.

MOSCOW, IDAHO.—John H. Wourms of Wallace, Idaho, has applied for a 50-year gas franchise.

WILLIAMS, CAL.—The citizens of Arbuckle decided to organize a lighting district at a recent election.

BELLINGHAM, WASH.—The installation of tungsten lights to take the place of the present arc lights is under consideration by the council.

FRESNO, CAL.—It will cost about $6500 to install an electrolier system in the court house park, according to an estimate made by T. R. Harrold.

PASADENA, CAL.—The city commission has awarded the contract for a lighting system on Bellefontaine street to the F. O. Engstrom Company for $2365.

PASADENA, CAL.—W. A. McNally & Company has received a contract for the Terrace and Elevado ornamental lighting system, on their bid of $8945.

HOLBROOK, ARIZ.—T. M. Quebedeaux and H. K. Myers of Gallup, owners of a franchise for an electric light plant, are making preparations to start work at once.

FLORENCE, ARIZ.—At a meeting of the city council F. H. Ensign of Phoenix submitted plans for an electric and water system for Florence which would cost $46,000 to install.

ONTARIO, CAL.—The Ontario-Upland Gas Company will spend $20,000 in enlarging the capacity of the plant and installing new mains to reach portions of the city not served.

ARTESIA, CAL.—The vote carried on the question of establishing a lighting district for Artesia. It is believed work will be commenced at once by the Pacific Light & Power Company.

SAUSALITO, CAL.—Bids will be opened August 30th for the construction of an electrolier system composed of 65 standards, together with necessary globes and other appurtenances in Walter and Caledonia streets.

RIVERSIDE, CAL.—The board of supervisors, in response to a petition received from residents of Coachilla, asking that an election be called to vote on the formation of a lighting district, has set September 4 as the date for the election.

SOUTH PASADENA, CAL.—The contract for furnishing electrical energy for street lighting has been awarded by the city council to the Pacific Light & Power Company. The contract rate is 4c per kilowatt hour, including repairs, all extensions and improvements.

LOS ANGELES, CAL.—The board of supervisors will receive up to August 30 sealed bids for installing and maintaining an addition to the system of street lighting in the Annandale Lighting District, in accordance with specifications on file in the office of the board.

BEND, ORE.—By a vote of 239 to 219 the people of Bend defeated the electric franchise sought by Steidl & Tweet in competition with the Bend Water, Light & Power Company. Charles R. Brown of Chicago, president of the Bend Water, Light & Power Company, declares that his company is ready to purchase from Steidl & Tweet all the power they could produce at their plant at a price they had declared sufficient. Mr. Brown also said as a result of the defeat of the franchise his company now felt its way clear to proceed with extensions and improvements required by the future development of the town.

TRANSMISSION.

EVERETT, WASH.—A special election has been called for August 24th for the purpose of voting on the proposition of constructing a plant for generating electric power from the waterpower of Sultan River.

CANYON CITY, ORE.—Prairie City Light & Power Company is contemplating an extension of its plant in order to furnish power for dredging operations at John Day. Bonds will be issued to finance the project.

DUNCAN, ARIZ.—Representative John Christy has left for Black River, in the northern portion of the county, accompanied by O. Gibson of San Francisco, representing F. G. Baum & Company, to be met at destination by Messrs. Baum and Wilcox, and there are engineers in the party for the purpose of completing the survey for the hydroelectric power project begun last year, but remained unfinished on account of unsettled financial conditions due to the war. It is said that the proposed plant will be of sufficient capacity to generate power for all mining camps in the eastern portion of Arizona and New Mexico. Clifton, Morenci, Metcalf, Globe, etc., will be supplied with power.

TELEPHONE AND TELEGRAPH.

GILROY, CAL.—Sealed bids will be received up to September 24th for a franchise applied for by the Gilroy Telephone Company.

TRANSPORTATION.

OLYMPIA, WASH.—The state highway commissioner has granted a railroad right of way to the Washington Electric Company, 15 miles southeast of Chehalis.

GLASGOW, MONT.—It is stated that the North country farmers, allied with the American Society of Equity, are discussing the construction of an electric railway from Orpheim to Nashua via the all water grade afforded by streams.

MODESTO, CAL.—Traffic Manager W. F. Fuller of the Tidewater Southern Electric Railroad has filed with the supervisors an application for a franchise through the town of Ceres. This is the same franchise that Byron A. Bearce, president of the Tidewater, asked the supervisors to grant him the privilege of withdrawing after the recent controversy regarding the regulation of jitneys. The franchise is wanted at this time by the company in order that they may proceed with the extension of the road south from Modesto as soon as conditions will permit.

SAN BERNARDINO, CAL.—The Pacific Electric Railway is desirous of building an additional line of road on Mountain avenue, reaching from its tracks at Mountain and present right of way north to San Antonio Park,

above Twenty-fifth street, a distance of about 4 miles. The project was laid before a recent meeting of property owners on Mountain avenue, who decided to inform the railway people that if they build their line in the center of Mountain avenue and will pave a 10 ft. strip in the street in connection with the proposed improvement by the county, the line may be built.

WATERWORKS.

HALFWAY, ORE.—Engineers are at work on plans for a water system for Halfway, and bonds will be voted on soon.

GILBERT, ARIZ.—The Gilbert Development Company has purchased a large tract in the townsite of Gilbert and will lay a water system and install electric light and power lines.

ST. MARIES, IDAHO.—The $37,000 bond issue for the construction of a waterworks system carried. The city clerk was instructed to advertise for the sale of the bonds.

CHINOOK, MONT.—The council has under consideration plans for a filter, the cost of which is estimated at $12,000 to $15,000.

OROVILLE, CAL.—J. L. Mory of Chico was the successful bidder for the construction of the Gridley Sprinkling Plant at $3800.

POCATELLO, IDAHO.—It is reported that the fire and water committee will ask the city council for authority to dispose of the $400,000 worth of water bonds.

BREMERTON, WASH.—The proposition of the issue of bonds for the purchase of the water plant owned by the Bremerton Water Company, carried.

COUNCIL, IDAHO.—The city council is preparing to call a special election in the near future for the purpose of voting about $18,000 20-year bonds, the proceeds of which are to be used to install a complete waterworks system in Council.

POCATELLO, IDAHO.—It is the intention of the city of Pocatello to issue bonds in the sum of $400,000 for the purchase of a water system. Bids for the bonds will be received until September 1st.

KELLOGG, IDAHO.—George Westcott, fire chief, protests against 2-inch mains along Railroad avenue, holding that they will not furnish enough water in case of fire. The matter will be considered when the proposed franchise to the Kellogg Water Power Company comes up for final action.

BERKELEY, CAL.—Commissioner of Finance and Revenue Gompertz is working on plans for equipping the school department with its own water system. He believes that a series of wells could be sunk. He will submit his ideas to the city engineer to ascertain the cost.

LAMANDA PARK, CAL.—The California-Michigan Land & Water Company is to furnish water to the South Anita Tract and has completed at the expense of $5000 the installation of a ten-inch main from their tract, situated less than a mile from Lamand Park, known as Michilinda, for the purpose.

SALEM, ORE.—State Engineer Lewis has granted the city of Newport a permit to use 24 cu. ft. of the waters of Spencer Creek. The city proposes to construct a dam 9 ft. high and 301 ft. long. There will be a pipe line 10 miles long, connecting at the Newport end with a reservoir. The estimated cost is $24,000.

EL PASO, TEX.—The estimated cost of a pipe line from Elephant Butte dam to El Paso is $5,000,000, which would be too expensive. A more feasible plan would be to duplicate the present water system, use Mesa water for drinking and taking water from a canal at El Paso, pump it into another system of pipes for irrigation, boiler and street sprinkling purposes.

LOS ANGELES, CAL.—Owens River water is now available for domestic use in Van Nuys, the Van Nuys water system having been absorbed by the Los Angeles city water system. In order to connect the local system with aqueduct mains, it was necessary to lay about 2 miles of pipe along East Eighth street. The Franklin Canyon main was tapped with a 16-inch pipe, which gradually reduced to 8 inches at the point of contact with the main pipe of the Van Nuys system. The work was done under the supervision of H. J. Whitley and Geo. Hanna.

TRADE NOTES.

Portland, Oregon, offices of the Western States Electric Company have been moved from 45 North Fifth street to 10-16 East Union avenue, where a large warehouse has been maintained for some time.

M. J. Walsh & Company have received the contract for the electrical fixtures in the new store of the Wonder Millinery Company on the corner of Sixth and Alder streets, Portland.

E. L. Knight & Company are doing the electrical construction in the new warehouse being erected by the D. P. Thompson Estate at Fifteenth and Irving streets, Portland.

The West Coast Engineering Company has obtained the electrical contract for all of the electrical installation in the new First National Bank Building, on the southwest corner of Fifth and Stark streets, Portland.

Recent orders booked by Allis-Chalmers Manufacturing Company show an encouraging increase in the application of large induction motors in the Pacific Northwest. The Pacific Coast Steel Company has ordered one 1200 h.p. and one 800 h.p. form ANY, three bearing induction motor for driving respectively the 22 in. mill and 12 in. mill at their Seattle plant. The company is also furnishing fly wheel, shaft and water cooled bearings, which will be used in connection with the roll drives. The Sperry Flour Company has recently ordered from the same company a 400 h.p. motor of the same type. W. A. Kraner & Company, of Portland, has placed an order for one 1250 kw. Allis-Chalmers high pressure steam turbine unit, together with auxiliaries. This will be installed at the new power plant for the city of Ellensburg, Washington. This steam plant is designed as a reserve to the municipal hydroelectric plant. The Alaska Gastineau Mining Company has ordered a complete hydroelectric equipment for the Annex Creek project at Juneau, Alaska. Two 1750 kw. form AK alternators will be furnished as well as exciters and four 1250 k.v.a. transformers. The water wheels for driving the generators are of the Allis-Chalmers impulse type with governor actuated needles nozzles. The generators are of the inclosed type with self-contained forced ventilation. The Northern Board & Paper Mills of Sumner, Washington, have ordered a 150 kw. transformer to increase the capacity of its present transforming equipment. Among the orders for small motors recently booked are a number for J. H. Parker's new shingle mill at Blaine, Washington.

NEW CATALOGUES.

The General Electric Company has just issued Bulletin No. 44407, covering the GE-225-B, 600/1200 Volt Ventilated Commutating Pole Railway Motor for high speed interurban service. The bulletin gives a complete description of the construction details and shows some characteristic operation curves. Bulletin No. 46110 illustrates and describes Electrostatic Voltmeters for laboratory use, the "vano" types for 3, 5 and 10 kilovolts, and the "pan" type for higher voltages up to 50,000 volts. Bulletin No. 47406, describes Type F, Form K-20 Oil Switch, for use on voltages up to 2500. The bulletin contains illustrations and diagrams of the various styles of these switches.